

Note on the Effects of Distance upon the Spectra of Physical Clusters of Stars. By E. J. Stone, M.A., F.R.S., Radcliffe Observer.

I considered, in 1877, the nature of the spectra of physical clusters of stars of which the individual members were sufficiently near to each other, relatively to the distance of the stars generally, to sensibly influence—by their mutual gravitation and heating effects—the distribution of the coronal matter which surrounds an isolated star, such as our Sun. In the case of such a cluster, consisting of three, four, or any definite number of stars, the coronal matter would become distributed through a limited portion of space. I stated that in this case the brightness of the spectra of the individual stars would decrease in the proportion of the inverse square of the distance; but that such would not be the case with the spectrum of the sensibly continuous luminous surface formed by the gaseous corona. And that consequently, although in the case of such clusters at moderate distances we might, and should, observe directly the spectra of the individual stars forming the cluster, yet at greater distances the light thus received might become less than that received from the sensibly continuous gaseous envelope.

My views were objected to on the grounds that the light of the corona around each star would decrease in the same way as that of the individual stars; and such would have been the case, and the objection a fatal one to my views, if the coronal matter around each star of such a cluster remained isolated and not distributed over a finite space by the mutual actions of the individual stars of the system. But after I had called attention to the point that my reasoning applied to physical clusters with the necessary distributed gaseous matter over a limited space, no more was heard by me of this criticism.

But I have been surprised to read in Frost's English edition of Dr. Scheiner's *Treatise on Astronomical Spectroscopy*, p. 232, as follows:—

“This hypothesis has been criticised on various sides, and its principal fallacy may be easily seen. Stone overlooked the fact that the number of stars whose light enters the slit increases just in proportion as their brightness decreases.”

Now what is here stated by the authors as a fact is certainly not true.

In the case of surfaces of sensibly continuous illumination the compensation mentioned is effective, but it would not be effective in the case of three, four, or any definite number of isolated stellar points.

It may perhaps save time to some who consult Frost's work if attention is called to an error in the numerical value assigned

to the constant number in Balmer's formula, which is given on p. 230.

The frequency

$$N = \frac{1}{\lambda}$$

is stated to be found for the hydrogen lines from the equation —

$$N = 2748 \cdot 13 (1 - 4m^{-2})$$

and a reference is given to the *Phil. Mag.* 1890. But I find that—

$$N = 2742 \cdot 625 (1 - 4m^{-2})$$

or

$$\lambda = 3646 \cdot 141 \frac{m^2}{m^2 - 4}$$

gives the standard wave lengths with much greater accuracy.

On the Comparison of Reflector and Portrait Lens Photographs.

By E. E. Barnard.

In the *Monthly Notices* for 1896 April Dr. Roberts has given a comparison of the photographic plates made with his 20-inch reflector, and with two portrait lenses of $3\frac{1}{2}$ and 5 inches diameter. These small lenses have foci of 9.56 inches and 19.22 inches respectively, while the 20-inch reflector has a focus of 98 inches. At the close of his paper Dr. Roberts takes occasion to criticise several of my star photographs, now in the possession of the Royal Astronomical Society, which were made at Mount Hamilton with the 6-inch Willard lens of 31 inches focus.

These comparisons of the portrait lenses with the reflector might be objected to upon several grounds. First of all, the only claims of superiority that I know of which have been urged in favour of the portrait lens are its advantages, on account of small scale and wide field of view, in showing very large and faint nebulous areas, the phenomena of the tails of comets, and the structural forms of the Milky Way. In these special fields it is supreme, and likely to remain so until some better instrument than any hitherto used has been devised for this class of work.

The method of comparison by counting the number of stars shown on equal areas of the reflector and portrait lens plates is not only not the best one, but is very unfair to the short focus lens. On account of the smaller scale of the portrait lens, what will appear as several stars on the reflector plate will often coalesce into one star on the plates with the portrait lens, and for this reason a count of the stars, particularly with a long exposure, must necessarily be favourable to the larger instrument.